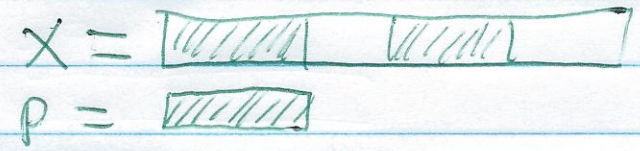
6 Shift-and-or

Pattern matching



Find all occourences of p in X

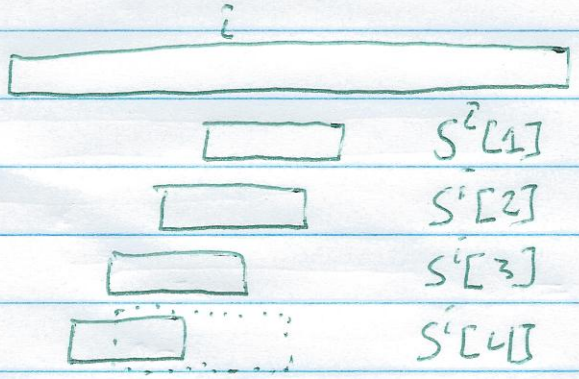
Naive

Try all positions

$O(n-m)$ - Can we do better?

Shift-and-OR

Conceptually place p m places along x.



$S^i[j] = 0 \Leftrightarrow X[i-j+1..i] = p[1..j]$

Match if $S^i[m] = 0$ at position $i-m+1$

calculate S^i from S^{i-1}

$S^i[j] = S^{i-1}[j-1]$ OR $t(j)$ where

$t(j) = 0 \Leftrightarrow X[i] = P[j]$

Use a table $t(a,j) = 0 \Leftrightarrow p[j] = a$

$t(a)$ = bit vector.

Can calculate S^i as
$S^i = S^{i-1} >> 1$ OR $t(x[i])$

Time analysis

Preprocessing
- Set all entries to 1 $|\Sigma| \cdot m/w$
- Set some entries to 0 m

$O(|\Sigma| \cdot m/w + m)$

for $j = 1 \ldots m$
$t(p[j], j) = 0$

Search time
$O(n \cdot m/w)$